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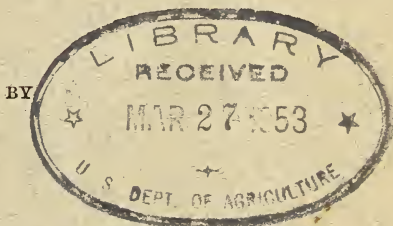
S. P. I., No. 2.

U. S. DEPARTMENT OF AGRICULTURE,  
DIVISION OF BOTANY.

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# VANILLA CULTURE

AS PRACTICED IN THE SEYCHELLES ISLANDS.



S. J. GALBRAITH.



WASHINGTON:  
GOVERNMENT PRINTING OFFICE.  
1898.









FIG. 1.—VANILLA IN FLOWER—SOME OF THE FLOWERS ALREADY GROWN INTO SMALL PODS.



FIG. 2.—VANILLA IN FAIR CROP, ON BARS AND POSTS UNDER SHADE.

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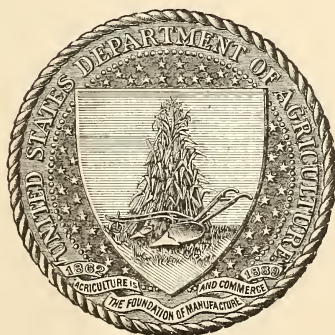
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## CONTENTS.

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	Page.
Introduction to Mr. Galbraith's paper, by D. G. Fairchild.....	7
General conditions.....	9
Starting a vanillery.....	10
Preparing the vines for cropping.....	13
Pollination of the flowers.....	15
Curing the pods for market.....	17
Miscellaneous information and notes.....	21
Summary.....	23

## ILLUSTRATIONS.

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### PLATE.

#### PLATE I.

Page.

- Fig. 1, vanilla in flower—some of the flowers already grown into small pods;  
fig. 2, vanilla in fair crop, on bars and posts under shade.... Frontispiece

### TEXT FIGURES.

- FIG. 1. Hand pollination of the vanilla flower..... 16  
2. Plan of curing house..... 19

## INTRODUCTION TO MR. GALBRAITH'S PAPER.

By D. G. FAIRCHILD.

The following paper on vanilla culture has been prepared by Mr. S. J. Galbraith, of Mahé, Seychelles Islands, who was for some time associated with Mr. W. T. Swingle, agricultural explorer of the Section of Seed and Plant Introduction, in the preparation of a joint memoir on the culture and disease of vanilla in those islands.

As the second part of the report, which deals with the disease, has not been completed, it seems desirable not to delay longer the publication of this part, relating to vanilla culture, inasmuch as it is practically complete in itself.

Although the vanilla is a plant native to America, its culture is now carried on most extensively and successfully in Bourbon, Seychelles, Mauritius, Madagascar, and other islands lying in the Tropics in the Indian Ocean east of Africa, as well as in the Island of Tahiti in the South Pacific.

The vanilla industry is a very important one in the Seychelles Islands, and Mr. Galbraith, himself for many years a successful planter, is in a most favorable position to write on the subject of vanilla culture.

The vanilla is a climbing orchid, the nearly mature pod of which is the part known to trade and that which furnishes vanilla flavoring. The plant grows wild only in the Tropics, and is so sensitive to cold that its culture can be successful only in regions absolutely free from frost.

The recent annexation of the Hawaiian Islands, Puerto Rico, and other tropical territory has added to our domain regions which there is reason to believe will prove admirably suited to the cultivation of this plant.

The competition of artificial vanilla, prepared synthetically by chemical methods, has not proved to be of any considerable importance. Indeed, the price of good vanilla has risen during recent years probably because of the ravages of disease in the islands where it is principally grown.

Prospective growers will be greatly aided in finding suitable climates and soil by Mr. Galbraith's recommendations on these points.

The disease mentioned in various places in this bulletin is the one described in the second as yet unpublished part of the original memoir. It is of fungous origin, of great destructiveness, and spreads during moist hot weather very rapidly, frequently causing total destruction of large plantations in a month. During recent years it has seriously crippled the vanilla industry in Seychelles, Bourbon, and other islands of the Indian Ocean. This malady spreads with extraordinary rapidity

where plants are crowded and allowed to intertwine, and for this reason Mr. Galbraith advises against close planting, though in regions free from the disease such culture might well prove more profitable than the methods here advocated.

Without going into details, it may be unhesitatingly affirmed from the results of Mr. Galbraith's very thorough and painstaking studies that the malady is of such great destructiveness, spreads so rapidly, and is so difficult to control, that it would, if ever introduced, ruin probably forever the prospects of successful vanilla culture in our new territories.

*It becomes, then, a matter of absolutely vital importance to keep the disease out of Hawaii and Puerto Rico if it is ever proposed to grow vanilla there.*

No surer method of destroying in advance the hope of establishing this highly profitable industry could be conceived than that of carrying out the first thought that would occur to an enterprising prospective cultivator, viz, of sending to the islands of the Indian Ocean, where vanilla culture is most highly developed, for a stock of plants to use in starting a vanillery.

The only possible way of safeguarding our new domains against this disease is to prohibit absolutely the introduction of living vanilla plants except by the Government, and then only after inspection by a competent plant pathologist.

Fortunately vanilla plants may be multiplied very rapidly if placed under favorable conditions, and from a small stock of disease-free plants it would soon be possible to stock all the islands.

The Secretary of Agriculture proposes to secure such perfectly healthy plants for distribution to planters wishing to experiment with vanilla culture, and it is hoped that meanwhile, in the absence of any definite legislation on the subject, public opinion will prevent any promiscuous importation of vanilla cuttings.

As soon as the plants begin to yield pods the services of an expert should be secured to superintend the curing, for which specially constructed apparatus is required, and to report on the quality of the product.

There is every prospect for the successful establishment of vanilla culture in Hawaii and Puerto Rico, provided suitable soils and climates be found, and provided the disease be excluded. Certainly an industry which yielded to the small island of Tahiti in 1897 \$172,295, to the Seychelles \$246,600 in 1897, and to Réunion \$560,563 in 1892 is worthy the serious attention of prospective cultivators. The desirability of publishing a practical paper on the subject at this time is emphasized by the conviction that both Hawaii and Puerto Rico offer suitable fields for the introduction of this industry.

# VANILLA CULTURE AS PRACTICED IN THE SEYCHELLES ISLANDS.

By S. J. GALBRAITH.

## GENERAL CONDITIONS.

Vanilla cuttings are said to have been first introduced into the Seychelles Islands in 1866, probably from Bourbon (La Réunion), where the plant was grown extensively after sugar began to fail, about 1850. Plantations were gradually established and extended by the multiplication of these original plants and from others subsequently imported, and for many years now the colony's prosperity has largely depended on vanilla.

If kept free from disease it is a plant of extraordinary vitality; and here, where moisture and heat, its main requirements, are both ample, the sort of soil it is grown in seems to be of no great importance, provided that, if it be very poor, the roots are kept well supplied with manure. It is cultivated in the Seychelles from near sea level to 1,800 feet altitude, and does well (except for disease) at all altitudes between these extremes.

The rainfall is generally about 100 inches—that is in Port Victoria, which lies low; in the hills the precipitation is probably from 10 to 30 per cent greater; and in drier districts, away from high lands, where little timber is left, it must be considerably less. The fall is fairly evenly distributed throughout the year, but a dry spell, which is necessary to bring vanilla into flower, is to be looked for in July, August, or September, while the heaviest rains most frequently come in December. Even where rain has not fallen for some time the air is very moist, and for want of more exact information on this head it may be stated that, generally speaking, in the hills common table salt will deliquesce in a day or two if left uncovered. The range of shade temperature for day and night, from sea level to 1,800 feet, may be put at 90° to 70° F. The former is exceptional, the latter frequent, especially in early morning when the monsoon is blowing. Occasionally 68° may be registered, but seldom lower. Of soils, three very different sorts may be mentioned, in all of which vanilla does well here: (1) Rich vegetable mold, common enough in forest land as a thin surface skin, and also occurring deeper in valley bottoms. For a quick growth this is excellent. (2) A greasy red clay, also in fair quantity, on which vanilla makes good growth. (3) Coarse quartz sand, or gravel, apparently derived from disintegrated granite, not common, but met with in con-



siderable patches here and there. Though so unpromising to look at, this is, perhaps, the best of all. It gives free drainage to the roots, and in wet years plants fixed on it are more likely to crop than those on closer soils, while with ample manuring they grow remarkably well.

The manner of setting out plantations in the Seychelles has undergone changes within the last twelve years. Formerly plantations were seen with the rows of vines planted so close together as scarce to leave room for workers to pass between them. The yield per acre under such conditions was sometimes enormous, but when disease once started in a vanillery thus arranged its destruction was rapid and complete, so this system has been mostly given up. Since the loss of so many close-lined plantations the distance between the rows has been increased. Living wood, i. e., small trees, are used as supports for the vines, these being festooned from fork to fork; but many planters have made use of hard-wood posts and bars, the former being notched on top and the latter laid in the notches, resting thus from 4 to 6 feet from the ground, according to fancy. Over these bars the plants are hung (Pl. 1), being looped up as growth is put on. Wire is sometimes also used instead of horizontal bars. It is much cheaper, but otherwise has disadvantages, notable among which is that it sways with wind and is liable to break the vines, the curvature being too sharp over such a small round surface. However, when plants thicken into a mass this last drawback mostly disappears.

A third, and, as the writer believes, much better way of growing vanilla, is now more generally coming into practice. This is to plant each creeper on a tree of its own, and where land is cheap it is an advantage if these are well apart. So arranged, the general maintenance of a vanillery is certainly more expensive, inasmuch as isolated plants require more manure than when the same number are closely grouped together. The work of flower pollination and crop gathering is also more laborious. But more than a counterpoise to these disadvantages is the increased security this method of planting gives against wholesale destruction from disease; for when so arranged a sick plant can be removed and destroyed with greater chance of this being done before any of its neighbors become affected; whereas when growths of different plants are interwoven, either in their roots or shoots, it is difficult to know when enough has been taken up, and there is every likelihood of the disease becoming established beyond control.

#### STARTING A VANILLERY.

To give some notion of how a vanilla plantation is set out and carried on in this colony, it will be convenient to assume that the tree method of planting is the one adopted. A great variety of trees will serve the purpose. Here, on most properties, there is an abundance ready for the work; but of course where this is not the case suitable trees must first be planted. In selecting trees those should be chosen which do



not grow too large, but give moderate foliage (about half shade) without ever losing all their leaves at once, and having plenty of branches from 5 to 7 feet from the ground, affording forks enough to train the vines through.

No hard and fast rule can be laid down as to the distance trees should be kept apart. Here formerly, as above stated, vanilla was grown in dense masses with great success for a time. Elsewhere it may be advantageously so grown now. However, it is safe to state that overcrowding in any kind of planting invites disease, and the farther plants are kept apart the more likely are they to remain healthy. A 4-foot radius would be a moderate allowance for the roots of a vigorous vanilla plant, and if 1 foot is kept clear around the circle allowed to each plant's roots this would give 9 feet as the distance between the trees. It would be difficult to insure the plants being kept distinct in less space. Where suitable trees are already growing on the land to be planted, these can be thinned out if too close, or they may be left in small lots of three or four or more together, a sufficient clear space intervening between each lot; but in that case if one vine of a group showed disease the whole would have to be removed. Many trees stand topping, and it is a great advantage when they do, for on being cut 7 feet or so from the ground branches spring from near the cut part at a convenient height, and the best situated of those can be chosen to train the vines through, the rest that grow awkwardly being removed. About 5 feet from the base is low enough to allow any to grow.

Trees being in readiness, planting may be done at any time of year here. If during a wet spell, vanilla will sprout all the quicker; should it be dry, the plants will delay a little, but there is no fear of their missing if properly planted, and the one danger point to guard is where the vine leaves the earth. This part of the vine is burnt through if not shaded with grass or leaves. However, this also would only mean a little delay in the start of growth; for though they take some time longer about it, vanilla cuttings will grow well enough if merely tied to the trees with their lower ends some inches clear of the ground. Illustrative of the extreme vitality of plants under adverse conditions, it may be mentioned that in neglected plantations, where the vines have been allowed to climb well up into the branches of good-sized trees, and then been broken in attempting to get them down, the broken portions, sometimes partly swinging free, have remained green and capable of growth for upwards of a year, sending down long aerial roots 15 or 20 feet in length, and in some cases where these have escaped injury the broken plant may reestablish connection with the soil and start to grow again. If planted clear of the ground and merely tied to the supporting tree, it is advisable to tie two or three large leaves round each vine for the distance of 3 feet up; thus shaded the aerial roots quickly burst through the stem, and, getting something to cling to at once, soon make their way to earth without injury.

In starting a new vanillery, where the estate has no plants these are readily purchased here at small cost. From 2 to 3 rupees (55 to 90 cents) per 100 fathoms is the usual rate for cuttings, the fathom being what a man can span with outspread arms, a good sweep of the vine hanging in a curve between his hands. Where choice is possible, although oldish cuttings will grow pretty well, it is best to have the plants of recent growth; in fact, growing shoots, cut off close to where they spring from the parent vine, are preferable. At their point of origin the nodes for some distance are close together, and though roots will strike from any joints, they have a natural tendency to do so quicker at the shoot's base. As to the length of cuttings to plant, opinions differ; but there can be no question that the longer cuttings produce cropping plants sooner than the short ones. If a 2 or 3-foot branch is planted, the shoot it gives is invariably more slender and slower of growth than would be that from a 6-foot cutting, and up to 10 or 12 feet every advantage lies with the longer plants, except the additional expense.

The question as to whether cuttings of that length are to be planted whole or divided into two or three plants should be settled by their cost. It is usual here to loosen the soil with a hoe where vanilla is to be planted, and bury the end, laid horizontally, an inch or two in the earth. Quite as good a way is merely to press the lower part of the plant into the soft soil until it is flush with the surface. On sloping land loosened soil washes away sooner with heavy rain, and in such situations it is best to leave the ground quite undisturbed. In any case the leaves on that part of the vine which rests in or on the ground are cut off fairly close to the stem, and an arm full of leaves, fern, grass, or forest sweepings laid on top to the depth of 3 or 4 inches, for a couple of feet around the plant. Its roots will not need to be mulched for a greater distance than that for some months to come, and to cover a larger area would be useless. As new top dressings are laid on, which must be done when the first supply rots down and becomes thin, these can be gradually extended to allow of more root spread, till the limit of 4 feet radius is reached. If well covered, the roots do not run much; only starved vines run far with their roots, seeking nourishment; where this is plentiful they mat in and beneath it. Being entirely surface feeders, should any make their way beyond the cover they can be gently lifted and tucked under the decaying leaves, etc.; but this is a hint that the plant needs a new supply of top dressing. The number of joints laid on or in the soil will vary with the length of the plant, but should not be less than three for this mode of planting, while for long cuttings six or seven joints are needed for a quick start.

If of sufficient length, the free end of the planted vine is hung through a fork of the supporting tree, but it is also advisable to tie it in two or three places to the tree to hinder swinging and chafing. The material

used for these ties here is a fiber called *vacoa*\* which rots in about a year, by which time the plants should have tendril-like roots enough to steady themselves. When once properly planted, the cuttings will need little or no attention for some months, but when the growth becomes vigorous the shoots must be looked after. Such of them as have grown clear of their supports are hitched up and, if long enough, hung through one of the forks. An occasional tie here may also be necessary, but in general a leaf or two of the growing part can be hooked on to some other fixed part of the vine, and in a few days, unless blown loose, the tendrils will have fastened to the leaf, and thus support the plant. Shoots must not be allowed to climb very high among branches of the supporting tree, especially if there be many and close together, or there will be breakages in getting them down. For this purpose, when they get beyond hand reach, a forked stick 6 or 7 feet long is useful. The fork is worked between the tree and climbing vine, and its tendrils in succession are broken by pushing and twisting the stick when they are within the fork. The last two or three tendrils are easily broken or leave the tree without breaking, and care should be taken when the vine is nearly clear to catch the stem of it high up, within the stick's fork; it can then be lowered gently without fear of breaking.

Some judgment is necessary in selecting the fork of the tree through which each shoot is to hang, a fork whose height fits in with a natural bend of the vine, if it has one, being chosen; otherwise one whose height takes the vine between joints is best, since if bent at a joint the vine is apt to snap, especially so when in vigorous growth, being then full of sap and brittle. In good growing weather—i. e., warm, still, and moist—healthy, well-nourished vanilla vines grow very rapidly, an inch per day being no uncommon rate.

#### PREPARING THE VINES FOR CROPPING.

If the plants have done well they should be ready for such preparation in about eighteen months, more or less, according to the season. Formerly in this colony they were allowed to grow on until a spell of dry weather set in prior to the usual blossoming time. The growing ends were then cut off and all new shoots removed as they showed till flowers began to come or till the season for them was past. When the dry spell proved a long one, this seemed to answer pretty well; and, indeed, under these circumstances flowers would come in any case, whether growth was checked or not. But now it is more usual to stop the growing ends some nine or ten months, in the first instance, before flowering time. In the majority of cases the terminal bud will push, and this new shoot should also be removed when 5 or 6 inches long—not earlier, else the next to the last bud is apt to grow.

After the second checking most vines will shoot far enough back to

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\* Obtained from a species of screw pine, *Pandanus utilis*.



allow of the shoots being left. These grow on for the next year, and the stopped branches hang down with their lower ends a good foot or more from the ground, being generally from 4 to 6 feet in length, according to the heights of the forks through which they are hung and the positions of the new shoots, though these generally spring just before the last bends of the checked branches, which are to be the cropping parts. The new growths behind these are supposed to drain them of their sap, and thus conduce to flowering. However that may be, these checked hanging branches have certainly more tendency to flower than other parts of the vines. Flowers take some six weeks to develop from the moment they burst through the buds to their time of opening, but this period varies in length with the weather, continuous dryness retarding and moderate showers hastening their development when once started.

The growing branches of vines should now be checked again for the following year's crop. These will be less troublesome in putting out inconvenient shoots, as the plant's sap is more apt to go into flowering branches, where nourishment is now more needed. Could the whole work be performed in a few days, this change in the direction of sap flow should be done preferably ten days or a fortnight before flowers begin to open. In a large plantation, unless the hands are very numerous or the shoots have been arranged beforehand so that there is little else to do than cut their ends, it will take some weeks to accomplish this, and therefore work must begin earlier or finish later. If the dry spell necessary for flowering has lasted a good while and can fairly be depended upon to continue long enough, the growing ends may be cut earlier; but it must be borne in mind that if rain in quantity comes too soon and, in addition to the stimulus given by it, the branches intended for flowering have also the sap from previously growing shoots poured into them, the chance of their cropping well will be much diminished. Many a promise of a fine crop is ruined by too early rain here. The country, climate, and the planters' skill as a weather prophet must govern this undertaking.

An abundant supply of leaf mold should be in readiness for laying on the roots at this season, and should be applied when flowers begin to open, or a little before. If previous dressings have been so timed that vines are in a somewhat starved condition when flowering is expected, the chances of a good blossoming are increased, but this practice needs judgment, or a poor quality of pods will be the result.

There used to be a story current here, no doubt with some grain of truth in it, to the effect that in a very wet season the only vanilla planter who had any crop was one whose pigs had got adrift in his plantation and spent the night in grubbing up vanilla roots. This method of producing flowers is not recommended, but it is quite possible that careful and systematic root pruning might be carried on with advantage in wet years, if one could tell beforehand when these were coming.

## POLLINATION OF THE FLOWERS.

The work of flower fertilization (pollination)—for they have all to be fertilized by hand, and that on the day they open—is mostly done by women and children. The operation is a very simple one, and an average negro will acquire the knack after being shown a few examples. (See fig. 1.)

The flower is taken in the left hand, three fingers being placed at its back and the thumb in front, the column with organs of fertilization on top being supported against the middle sepal behind. A bit of hard wood, cut to the size of a toothpick and scraped smooth and flat at one end, is the only tool required; this is held in the right hand. To get at the organs of fertilization easily, the sack which grows from the side of the column enveloping its front and marking the sexual organs is pressed down by the bit of wood, or this is run through its base, and the sack torn up, or the whole sack may be plucked off with finger and thumb, it matters not how it is laid open, so long as this is done quickly and without injury to any other part of the flower. The smooth end of the fecundating instrument is then laid flat on the front of the column just beneath the organs of fertilization, and being pushed up it catches under the flap which keeps the pollen from coming into contact with the stigma. The flap is raised along with the stick till it lies flat against the upper part of the column, being held in that position by the bit of wood. The stamen, at first raised along with the flap, now falls down again in its original position, and the flap being out of the way the pollen comes into contact with the stigma, and a slight pressure of the thumb on the stamen lodges the pollen in the position required; the bit of stick being then quickly but gently withdrawn, the operation is complete.

The whole affair is very much easier done than described, and with flowers fairly numerous an ordinary hand will fecundate a hundred or so per hour. Early morning, from 7 to 9, is the best time for fertilizing; but the work may be started with sunrise and carried on well into the afternoon, though about midday flowers begin to close some and the work goes slower. Most plants in full crop produce many more flowers than it is advisable to fertilize, for other parts of the vines, besides the checked hanging branches, blossom in favorable seasons, and the number of pods which a vine is able to mature properly must be estimated from the plant's size and condition. In the course of four or five years, though by that time the planted cutting will be spent, if well cared for it will have grown a large quantity of vine; and as each new shoot, when long enough, sends down aerial roots in its own behalf, it becomes, so to speak, an independent plant and the parent of others. If none of the shoots from a strong growing vine have been removed the mass of growth in time becomes enormous, and may be equal to maturing a hundred or more good pods. When the supporting tree is stout and furnishes forks enough to admit of the vine being spread out so as to

let plenty of air through it the vine may be allowed to accumulate to this extent, and if it gives, say, 20 clusters, each yielding 10 or more flowers, 5 or 6 might be fertilized on each.

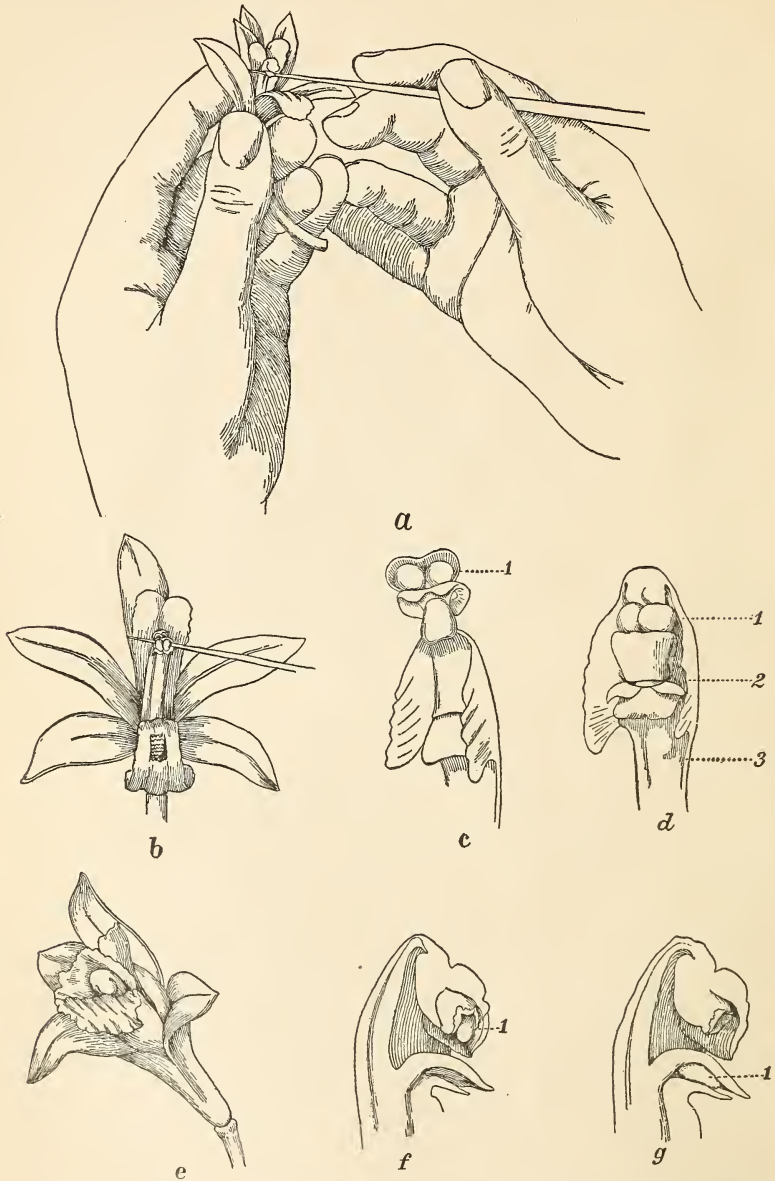


FIG. 1.—Hand pollination of the vanilla flower (after A. Delteil, *La Vanille*, Paris, 1897, Pl. 2). *a* shows the position of hands, needle, and flower in the operation of pollination, first stage; *b*, operation of pollination, second stage; *c*, flower with male organs raised (pollen masses shown at 1); *d*, flower from which outer parts have been removed, showing pollen masses at 1, stigma at 2, and the gynostemium at 3; *e*, perfect flower; *f*, longitudinal section through male and female organs of the flower before hand pollination, showing pollen mass in the anther or male organ at 1; *g*, similar section after hand pollination, showing the pollen mass applied to the stigma at 1.



But, generally speaking, about 30 pods to a vine is as many as should be left, and he would be a lucky planter who should average that number. In selecting flowers to fertilize those should be chosen which spring from the lower part and from the sides of the flower stalks, from which position they grow straighter pods than those coming out on top. In favorable weather, i. e., moist but not heavy rain (which latter often washes the pollen grains away before they germinate), only a small percentage of flowers will fail of fecundation. In case of failure, the flower drops off in three days or less, but otherwise remains attached to its stalk and slowly withers; the *gynostemium* adheres to most pods till they begin to ripen; thus it is easy to see the number successfully fecundated in each bunch, and where enough are secured the rest can be broken off. Later it is advisable to cut clean off with a knife the flower stalk a quarter of an inch or so beyond the last fertilized flower. Some planters plaster a bit of sticky clay on the cut surface to prevent it rotting back. Dry lime is perhaps better; this may be dabbed on with a piece of cloth dipped in the powder.

Pods grow to their full size in five or six weeks, but take some eight months, more or less, according to the altitude at which they are grown, or the amount of shade over them, before they ripen. The indication of ripening is a slight yellowing of the whole pod, which is more marked near its free end. When under too much shade the change in color is less noticeable, and many pods grown in such places split before they are gathered, and for that reason lose in value. To guard against splitting, and yet gather them at perfect ripeness, they should be gone over every other day. In removing them from the flower stalks the pods are grasped one by one near their attached ends, very slightly twisted, and at the same time pressed aside with the thumb. They must be taken off quite clean. If a bit of the flower stalk comes away with a pod, as sometimes will happen, it should be cut off smoothly. Any break or crack in the pod itself, however, near its butt, ranks it as an inferior quality. Buyers are very particular in this respect. After each day's gathering, before the pods are started on their first stage of curing, it is well to sort them roughly into four classes: 1, long; 2, medium; 3, short, and 4, split.

#### CURING THE PODS FOR MARKET.

There are many different modes of preparing vanilla, but for brevity's sake one alone will be described; it is probably the simplest, and appears to be as successful as any other. About 400 of the longest pods are placed in a basket and plunged into hot water (190° F.) for ten seconds; this is repeated twice, the dips being increased to twelve and fifteen seconds respectively, with intervals of half a minute between each two. After the third dip, when most of the water has drained off, the pods are placed in a wooden box or barrel lined with blankets, and closely covered up with the same material. When lot 1

is finished, lot 2 is similarly treated, and for them the water may be a few degrees cooler, or the dipping times a trifle shortened; and so also with lot No. 3, while No. 4 may be treated as No. 2. Perhaps it is as well to add that 190° F. is not an absolutely essential heat, but is about as high as it is safe to go; while even the longest pods may be adequately treated in water at 170° F. if they are kept in it long enough. An experienced preparer will be guided more by the appearance of the pod after each dip than by any fixed formula. Where small quantities are dealt with less heat is needed, and the above figures are given for a boiler 22 inches in diameter by 12 inches deep. It is best to have good-sized boxes or barrels to sweat the pods in, those holding 2,000 or 3,000 each being preferable, for the more pods there are together the better heat is retained. The lots (1, 2, 3, and 4) should be kept apart, a fold of blanket being laid on each if all go into one box. By the following morning they should have changed to chocolate or puce color, and are then ready to spread on the drying shelves; but if there is a large number together, and the heat has been well kept in, they may be left for another twenty-four hours.

A curing house for preparing a crop up to 2,000 pounds (dry) may have the following dimensions and fixings: 30 feet long, 15 feet broad, 13 feet in height of walls. It should be divided into four compartments, two on the ground and two above, each being approximately 15 by 15 and 6½ feet high. One compartment on the ground floor is used as a hot room, having a flue 2 feet wide covered with sheet iron running through the center. If the heat is too intense from this, sand may be sprinkled on top to reduce it. Above this flue and around two sides of the hot chamber tiers of shelves are fixed 6 inches apart, on which the pods are spread to dry. The shelves may be conveniently made of laths, on top of which mats or canvas can be laid; or fine-meshed wire netting would serve the same purpose, perhaps, better than anything else. The entire arrangement will be more easily understood by reference to fig. 2. Compartment No. 1 is the hot room. Dotted lines in it and in Nos. 3 and 4 indicate where shelves are fixed; D, door; W, window, etc. The table is used for sorting green pods on, and is otherwise useful at final measuring time and when the pods are tied into packets. No. 3 is above No. 1, and is also a warm room, some heat from No. 1 coming up through the floor. The clear spaces in Nos. 2 and 4 have fiber mats spread on them when required, and on these the pods are handled and sorted as they progress in curing. The worker, sitting on the floor, keeps the four lots of pods—long, medium, short, and split—distinct on the shelves. This facilitates the sorting, the short and split pods needing to be examined sooner and oftener than the longer and sound sorts, as they dry more rapidly.

A good average heat for the hot chamber is 110° F. A few degrees more or less does not matter, but pods are apt to dry too quickly if the heat is much greater. The slower the process the more uniform and

better is the result. As they begin to turn soft and show longitudinal wrinkles the pods are removed from room 1 to 3, and after reaching a certain degree of flexibility they pass on to the shelves in room 4 and there finish their curing. If kept too long in either a hot or a warm room the thin ends of pods shrink too quickly, and this is to be avoided. In a large crop there are always some inferior, ill-nourished pods, in

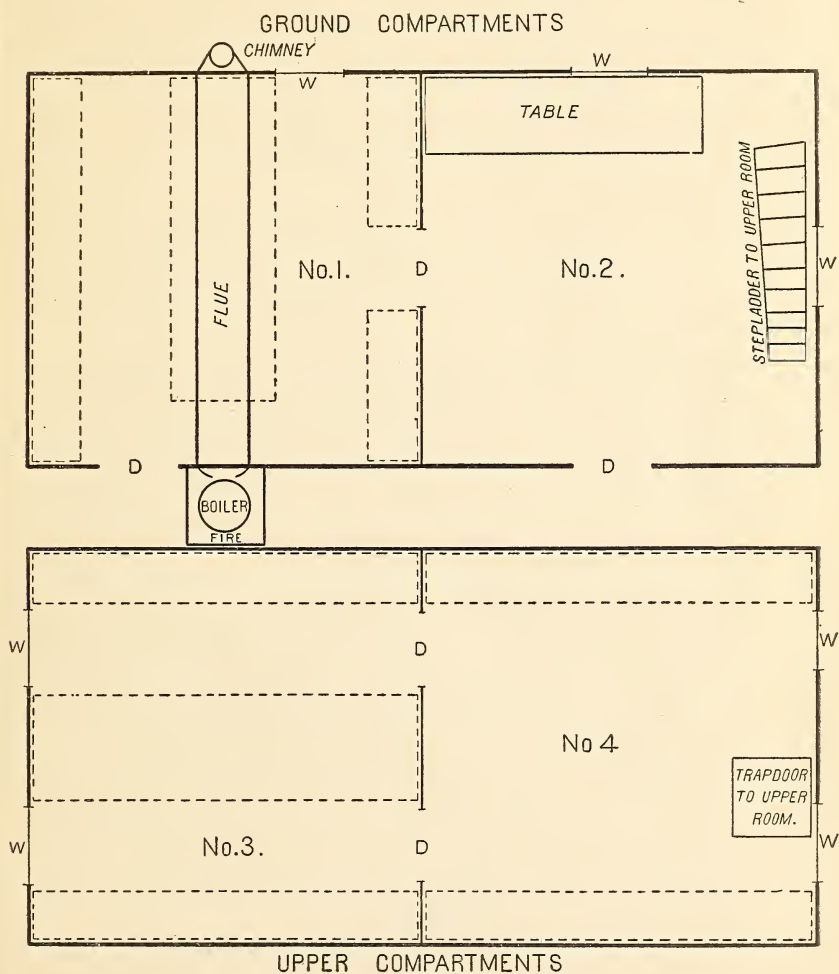


FIG. 2.—Plan of curing house. (Dotted lines indicate where drying shelves are fixed.)

which this occurs, but the last remark will be useful to a beginner. When fully cured the pods are much wrinkled and pliable, bending easily around one's finger. There is considerable difference in the degree of dryness preferred by different curers. If the contents move easily all along a pod, without any unevenness being noticed when it

is drawn between the finger and thumb, it is nearly dry enough; but the right stage can only be learned by experience.

When finished the pods are well wiped with bits of soft flannel and then kept in boxes with close-fitting lids. It is better to sort them roughly into lengths as each day's lot is put away and tie up the various sizes in bundles of about 200 each if the numbers allow of it, for they have to be examined once or twice a week in order to remove the molded ones, and this is much more quickly done with bundles than when they are loose. Moreover, it makes the ultimate accurate measuring easier. Either at this time or later the different qualities are more exactly separated, none but faultless pods, without scar or defect in curing, being allowed in the first quality. The rest rank as seconds, etc. The split pods and the pods that have been cut on account of mold are also kept distinct. It is well to keep a crop at least three or four months before marketing. By that time nearly all shaky pods that are liable to mold will have shown themselves. All are then measured and tied up in neat bundles of 50 pods each of even length, the pods varying in length not more than one-eighth of an inch.

The general sightliness of a marketed crop has much influence on the price it will bring, and whatever whims buyers get into their heads the producer must conform to or suffer in pocket. Bundle tying is something of an art, and a deft hand at it is valuable. Sixteen or thereabouts of the shapeliest pods in each 50 are selected for the outside; the rest are tied up as a core, being kept in position with a few turns of the fiber tying cord, while the chosen 16 are carefully placed round them. The bundle is tied in either three places, near each end and in the middle, or in two places, an inch or more from the ends, according to the length of bundle. The core-holding string is pulled out before the final tie is fixed. Two-tie packets are boxed as they are. With those of three ties buyers prefer that the end cords be removed before packing, to enable them to examine the bundles inside and see if the contents are of uniform quality. If kept tied some time before being packed the bundles set, as it were, and retain their neat shape. The tin boxes used here for packing vanilla in measure  $12\frac{1}{2}$  by  $8\frac{1}{2}$  inches in width, are  $4\frac{1}{2}$  inches deep, and hold about 12 pounds. Each box has a label pasted on it which bears the grower's trade-mark, the length and number of packets, their quality, and net weight, and a similar label is put inside. As some chemical action is set up when vanilla rests in contact with tin or iron, thin vegetable parchment paper is placed in the boxes to keep the two apart. The lids are then sealed close with pasted paper and the tins packed in wooden cases, 6 in each, and thus dispatched to market.



## MISCELLANEOUS INFORMATION AND NOTES.

A fair crop should average about 100 cured pods to the pound.

	Pods per pound.	
	Fresh gathered (about).	Dry (about).
9-inch pods.....	20	65
8-inch pods.....	25	80
7-inch pods.....	33	110
6-inch pods.....	50	160

The following crops, produced on one estate during the last five years, will serve to show how uncertain are the returns from vanilla growing here:

	Pounds.
1893 (long dry spell for flowering time in 1892) .....	1, 800
1894 (rain came too soon and spoiled good promise) .....	120
1895 (next to no dry spell for flowering in 1894).....	40
1896 (excellent promise mostly spoiled by too early rain).....	500
1897 (similar to the year before).....	600

Expenses for labor during these years would be about 7,000 rupees (about \$1,800 to \$2,000). Present price of vanilla (June, 1897) in London market averages about \$6 (25s.) per pound. The currency here is in Indian money—that is, rupees; nominal value of rupee, 1s. to 2s., but the actual value varies with price of silver and at present ranges between 1s. 2d. and 1s. 3d.

The day begins at 6 a. m. and work continues until 5 p. m., or to 4 p. m. on some properties; 11 to 12 is breakfast time. Rough work is quickest got through by giving “tasks,” when the negroes become energetic.

Ordinary estate laborers are paid 12 rupees (\$3.40) per month; women for crop curing, etc., are paid 9 rupees (\$2.60) per month; women and children for flower fecundating, one-fourth rupee (7 cents) per day, the “day” being when work is over, early or late. Vanilla packet tying, 2 rupees (58 cents) per 100 bundles of 50 pods each; vanilla measuring, 2 rupees (58 cents) for same quantity (5,000 pods).

Straight-stemmed palms, if stout, may be used for supporting the vanilla vines. By driving hard-wood pegs into them obliquely at suitable heights the vines can be hung about them as in tree forks.

When long vanilla cuttings are planted near blossoming time, some of them often give flowers soon afterwards. It is best to cut these off, as cropping a vine when newly planted lessens the growing power, and it may hang for many months, but in a regular plantation vines flowering too heavily may be relieved by cutting off one or more of the flowering branches. These may be planted for the one small crop they will give—3 or 4, or up to 10 or 12 pods, according to length and vigor. For this they may be planted close together on low bars and posts, and need well-rotted manure for immediate and abundant nourishment. The best time to plant for this is a few days before the first flowers open; if cut earlier many of the flowers will die back.

Cropping branches may be allowed to flower for two years if they have not missed a season, but never more than that, as the pods they then give are invariably very inferior; the best are on young wood a year or so old at flowering.

Prunings, when not too old, may be set out to rear new plants from. When extending the plantations it is better to plant the shoots from the prunings rather than the prunings themselves, if they are over 2 years old. If flung into jungle, especially among rough ground, rocks, etc., where there is shade and decayed leaves, they grow in a wonderful way without any attention and yield the best of cuttings. When shoots are checked for cropping branches, some of their tendrils occasionally elongate into aerial roots, and should then be cut off, or they will keep the branch full of sap and hinder its flowering.

Short varieties of grass seem rather beneficial in a plantation: cumbersome weeds should be hand pulled, never hoed.

During early crop gathering, before ripe pods are numerous enough to make it worth while using the hot room, they are cured under blankets in the sun, but have to be taken in at the hottest part of the day if sunshine is continuous. This used to be the sole method of curing here, and when used now gives excellent results in favorable weather; but dependence upon the sun is risky, and upon the whole the process is cumbersome and costly. Hand trays, that can be piled up on top of each other and carried between two men, are used to spread the blankets on, a fold being below as well as above the pods, and these are supported on low double rails to keep them clear of the ground. In unsettled weather showers have to be watched for, and the trays carried under shelter till the weather again becomes fair.

If there is a pinch for space in the curing house, pods in the hot room may be spread two or three or more deep on the shelves and tumbled up daily, i. e., such of them as are not taken off and re-sorted.

In mulching vanilla roots, and especially at crop time, the plants are much more benefited if the mulch be of two sorts, well-rotted leaf mold being put on first for immediate action, and above it a layer of withered fern or the like, which decays more slowly. When heavy top dressings of quick decaying manure, grass, etc., have rotted down, they get beaten away by rain, the network of roots becomes exposed, and may with advantage be lightly covered with a thin sprinkling of good soil. Obviously it is better to apply this before the roots become bare or visible. The vanilla roots delight in twisting among stones, large and small, and flattening against their lower surface when not embedded in the soil. When these are of a convenient size and handy in a plantation, the root circuit allowed to each vine may be ringed with them. Vanilla may be grown on trees of thick foliage if these are of a sort that will stand being well pruned annually. Wild cinnamon, which gives dense shade, is sometimes used for this purpose. the branches being nearly all cut off each year about pod-ripening time, which also lets the



sun get at the vines for flowering. The contrast between former somewhat dense shade, which has grown since last branch trimming, and the strong light let in by the pruning seems to help toward blossoming.

Under large, high trees, wide apart, where to plant vines on other small-growing wood between them would make the shade too close, vanilla may be fixed on tripods of durable wood, the three stakes being tied with wire crosswise, some little way from their top ends, so as to furnish forks over which the vine creepers may climb. High up in the hills here the plants may be grown in this way without any shade at all, but the plan is only suitable for level grounds or moderate slopes.

#### SUMMARY.

The foregoing account of vanilla cultivation, being the outcome of experience gained in the Seychelles alone, and there chiefly in the hills, may need many modifications to adapt it to different circumstances pertaining to other lands, and, indeed, possibly may be of little use for such. For instance, in a drier climate irrigation might be needful, and it would not be necessary with a reliable, sufficient annual dry period to prepare vines for flowering by checking their sap flow in certain branches, as it is in this colony. This is not found necessary in certain districts where the rainfall is not such as to keep plants growing continuously, for they stop growing of themselves and come into flower without coaxing.

Again, under less favorable growing conditions the vines would need more nutriment and attention to stimulate growth.

These and similar considerations which will suggest themselves to the reader may serve to save a brief summary from appearing too dogmatic.

The following conditions of climate, method of growing, etc., appear to the writer to be most favorable to the successful cultivation and handling of the vanilla crop:

*Climate.*—With shade temperature ranging about 80° F., never much above or below it, and a humid, still atmosphere; a rainfall of 80 to 100 inches or more, evenly distributed through ten months in the year, the remaining two months being dry, with occasional short and very light showers—the ten wet months for continuous luxuriant growth, the two dry ones to check it and bring vines into flower.

*Soil.*—A skin of rich vegetable mold resting on a porous substratum. Failing that, with the above climate, vanilla should do well on any soil if the roots are kept covered with decaying vegetation.

*Situation.*—Moderate slopes.

*Shade.*—Small-leaved trees to let checkered sunlight through.

*Plants.*—Cuttings 10 to 12 feet long of growing shoots, which should not cease growing if planted after the dry season, but go straight on and flower fully in two years.

*Planting.*—Either in line on posts and bars, or on shrubs of suitable size and leafage, at the risk of wholesale destruction from disease; or

plants well kept apart, each on its own support, so that any vine showing signs of sickness may be removed before infecting its neighbors.

*Culture.*—Plantations to be gone through bimonthly; shoots on the ground looped up; climbing branches brought down; decayed leaves, etc., laid on roots for manure when needed. Preparations for flowering according to climate.

*Cropping.*—Flowers to be pollinated in forenoon, preferably such as will hang clear and grow straight pods; quantity regulated according to mass and vigor of each vine, but not such as to hinder the start of new growth for more than two or three months. Pods should be gathered every other day.

*Curing.*—The slower the better, beginning in a heated room at about 110° F. for some days, then in a cooler one, 90° to 100° F., finishing at ordinary temperature; humidity of air kept down if need be by charcoal braziers.

*Marketing.*—Qualities and lengths kept distinct, made up in packets of 50 pods, and neatly packed in tins holding about 12 pounds each.

*Labor.*—Cheapness and intelligence are of the greatest importance in vanilla production. The cultivator must himself have his eyes everywhere; the best of labor known here deteriorates quickly if left to itself.